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Pareto Analysis on Budget Allocation for Different Categories of Faculties in Higher Education Institution

Rossidah Wan Abdul Aziz[a *], Adibah Shuib[b], Wan Noor Hayatie Wan Abdul Aziz[c], Norngainy Mohd Tawil[d,e], Abdul Halim Mohd Nawawi[f]

[a]Faculty of Computer and Mathematical Science, Universiti Teknologi MARA Terengganu, 23000 Dungun, Terengganu.
[bf]Faculty of Computer and Mathematical Science, Universiti Teknologi MARA, 40450 Shah Alam, Selangor.
[c]Faculty of Computer and Mathematical Science, Universiti Teknologi MARA Perak.
[d]Unit of Fundamental Engineering Studies, Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia, 43650 Bangi, Selangor.
[e] Centre of Engineering Education, Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia, 43650 Bangi, Selangor.

Abstract

Managing budget for optimum effectiveness at various levels of the university is always a challenging task. This calls for a highly effective budget planning. Budget planning enables an organization to set priorities towards achieving certain goals and to identify highest priorities to be accomplished with the available funds. Our study is concerned with the budget allocation in one of the public universities in Malaysia. Preliminary data analysis has been conducted to analyse the budget performance involving data concerning budget allocations of three groups of faculties. The purpose of the analysis is to determine the allocation proportions among these groups and to identify the faculties that have the greatest cumulative effect on the university budget allocation. These results will provide significant insights for the management in dealing with planning budget allocation. This paper describes the data, concepts, structures, categories, processes, results and discussions, including the Pareto analysis, that have been conducted.

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* Corresponding author.
E-mail address: rossidah@tmsk.uitm.edu.my

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1. Introduction

Financial management is an important issue nowadays either in profit organizations or non-profit organizations. It is defined as management of the finances to achieve financial objectives. Financial management plays three roles that are financial planning, financial control and financial decision making. Financial planning must be aligned with the strategic planning so that the organization can access and react to environmental and competitive changes without fail. Some organizations with good financial planning may fail in managing their funds if they cannot control their expenditures. Thus, in order to ensure the spending meets the objectives and the resources are being used efficiently, financial control is important. Financial decision making plays a very important role in making decision for financial allocation to match the budget activities. The most important tool utilized to perform these financial management roles is known as budgeting. Budget planning, or simply budgeting, is concerned with planning the allocation and spending of resources to meet certain goals (Xavier, 2002). Budget planning is important in resource allocation in order to allow the organization to set priorities towards achieving these goals and to identify highest priorities to be accomplished with the available funds. Adekanmbi and Boadi (2008) define budgeting as a financial plan that is mostly used in organizations. It is a useful tool for planning and efficiency, which provides guidelines for management in terms of both spending limits and priorities for spending (Dixon, 2003). Many budget planning involves optimally allocating resources. One of the advantages of budget planning is that a decision maker can systematically plan the proportion of budget to be allocated for the identified budget activities to match with the objectives and strategic plans of the respective department or organization. It is an easy ways to control and organize the financial effectively but many people are unsuccessful at budgeting as they disrupt their efforts by setting impractical targets or fail to monitor their progress satisfactorily.

Institution of higher learning is a non-profit organization that has its own missions and objectives. The issues of financial in institution of higher learning have been exclusively discussed among scholars and managements in many countries including Malaysia (Ahmad et al., 2012; Maxwell Awoingo, 2010; Kuo and Ho, 2008; Dejenee, 2007; Caballero et al., 2004). The scarce resources can be utilized optimally if the decision makers can allocate their budget efficiently. If resources and funds allocated for the universities' activities were not effectively utilized, this will result in inconsistency with the desired objectives of the government (Ahmad et al., 2012). Thus, systematic approaches and dynamic planning are required to achieve an efficient resource allocation in institution of higher learning (Lee and Clayton, 1972). According to Arbel (1983), budget allocation is said under limited resources when the total schools budget is less then total request for appropriations. The author studied the university budgeting problem that focuses on teaching and research activities. A budget allocation model that based on prioritizing the six departments by considering their benefit to the schools' future evolution and their cost of operations was presented. The budget model was structured in four levels that are school's budget, goals, supporting factors and departments' contribution.

There are two main parts of financial in preparing a budget for the public higher education institution (HEI) namely operation management financial and physical management financial. Operation management financial refers to the financial for managing operations of the university. These financials involve five categories which are salary or emolument expenditure, academic expenditure or services and supplies expenditure, Maintenance expenditure, student expenditure and other expenditure (Marzuki et al., 2007). Physical management refers to the financial for new buildings, infrastructure, accommodations and others. For a new university, more funds may be needed on physical management such as new buildings, laboratories, lecture halls, student accommodations and others. However, the university also needs funds for the development of human resources under the operation management funds. In contrast, an established university requires more funds for the operation management although physical management funds will still be needed to maintain the old buildings and construct new buildings to align with the increase number of students' enrolment and development of new programs. The

increasing budget required by a university and fluctuating budget allocated by the government requires appropriate attention and actions of the top management of the university.

This paper presents the scenario of budgeting in HEI based on a pilot study conducted. This pilot study serves as a basis for our research which concerns with developing a mathematical model for optimal budget allocation-execution of a university. The pilot study deals with the analysis of the faculties' operation management's budget allocation of a selected public university in Malaysia. The purpose of the study is to determine the proportion of budget allocation among three different groups of faculties in the university and to identify the faculties that have the greatest cumulative effect on the budget. Pareto analysis has been used in the pilot study. Pareto diagram is a quality tool used to identify and communicate the vital few causes and useful many of a situation developed by Dr Joseph Juran in 1941 from Romania as a universal concept that could be applied to many fields (Besterfield, 2004). Durga Prasad et al. (2012) stated that this quality tool is useful to reduce the many causes to vital few in helping the management to quickly identify the critical areas that deserve immediate attention. In their study, they used Pareto diagram to identify quality characteristics and their priority value that deserve immediate attention for achieving six-sigma quality in the engineering educational institutions. Tawil et al. (2012) used Pareto graph in identifying the dominant states with high rise housing in Malaysia for determining the scope of the study in Management Corporation's financial problem. In our study, Pareto graph is employed to identify the areas in highest financial operation management allocation that have the greatest cumulative effect on the university's overall budget. Based on the analysis, less significant factors are screened out. Thus, the Pareto analysis will allow the management to focus their attention only on the highest allocation factors in the university budgeting.

2. Research Methodology

Our research is concerned with the development of a new mathematical programming model for budget allocation and execution in an HEI. The pilot study for this research includes two parts. The first part is a survey with an analysis and the second is data collection and analysis. The survey is conducted to identify any problems in the university budgeting. The survey was structured to address four major areas in faculties budgeting system which are; how does a faculty utilize the budget?; how systematic is the faculty's budget planning?; does the faculty fully utilize the budget allocated each year?; and how efficient and effective does the faculty use the budget (monthly, quarterly, annually)? An analysis was carried out based on the faculties' responses. For data analysis, three years data on faculties' budget allocation and spending that reflect each faculty budget performance were collected. Data were analyzed to determine the budget allocation proportions for three different groups of faculties of the university and to identify the faculties that have the greatest cumulative effect on the university operation management budget.

The preliminary data analysis is an analysis of the faculties' budget performance for the three years, from year 2008 to year 2010. This paper analyses the allocation of the university operating management budget that have been distributed to three groups of faculties which are grouped together according to their academic areas. The analysis also includes cumulative allocation proportion of the physical management, other official departments, other institutions and other university branches labelled as 'Others'. In this paper, only the second part of the pilot study, which is the preliminary data analysis, is discussed. The preliminary data analysis is as the following:

The analysis utilizes two tools, the pie chart and Pareto diagram. Pie chart is used to determine the proportion allocation among Group 1, Group 2, Group 3 and Others. Percentage allocation for every group is calculated using the formula below:

$$Percentage\ allocation = \frac{Total\ allocation\ of\ the\ faculties\ in\ each\ group}{total\ university\ allocation} \times 100\% \quad (1)$$

Percentage allocation for each of the three groups that is Group 1 (% *G1*), Group 2 (% *G2*), and Group 3 (% *G3*), and others are derived from this formula:

$$\%\ G1 = \frac{\sum_{j=1}^{n1} C_{1j}}{U} \times 100\% \quad (2)$$

$$\%\ G2 = \frac{\sum_{j=1}^{n2} C_{2j}}{U} \times 100\% \quad (3)$$

$$\%\ G3 = \frac{\sum_{j=1}^{n3} C_{3j}}{U} \times 100\% \quad (4)$$

$$\%\ others = C = 100\% - \%G1 - \%G2 - \%G3 \quad (5)$$

$$U = \sum_{j=1}^{n_1} C_{1j} + \sum_{j=1}^{n_2} C_{2j} + \sum_{j=1}^{n_3} C_{3j} + C \quad (6)$$

Where,

C_{kj} = total budget allocated for the j^{th} faculty in Group $k, j = 1, \cdots, n_k$ and $k = 1, 2, 3$

n_k = number of faculties in Group k, where $k = 1, 2, 3$

U = total budget allocated for the university

On the other hand, Pareto diagram is used to identify the areas in highest operation management allocation that have the greatest cumulative effect on the university's budget allocation, and thus, screen out the less significant faculties based on the analysis.

3. Results and Discussion

3.1 Operation Management Budget Allocation

The proportions of operation management allocation of Group 1, Group 2, Group 3 and others in relation to the university's total budget allocation for year 2008 to year 2010 are presented in pie charts of Figure 1.

Based on Figure 1(a), Figure 1(b) and Figure 1(c), Group 1 was allocated 4% of the total university's budget in year 2008 to year 2009 as compared to 5% allocated in year 2010. Group 2 received 23% of the university's budget allocation in year 2008 and in year 2009, while in year 2010 the allocation of Group 2 has slightly increased to 26%. According to these Figures 1(a), 1(b) and 1(c), the allocation proportion based on university's budget for Group 3 in 2008 and 2010 is 5%, while in 2009 is only 4%.

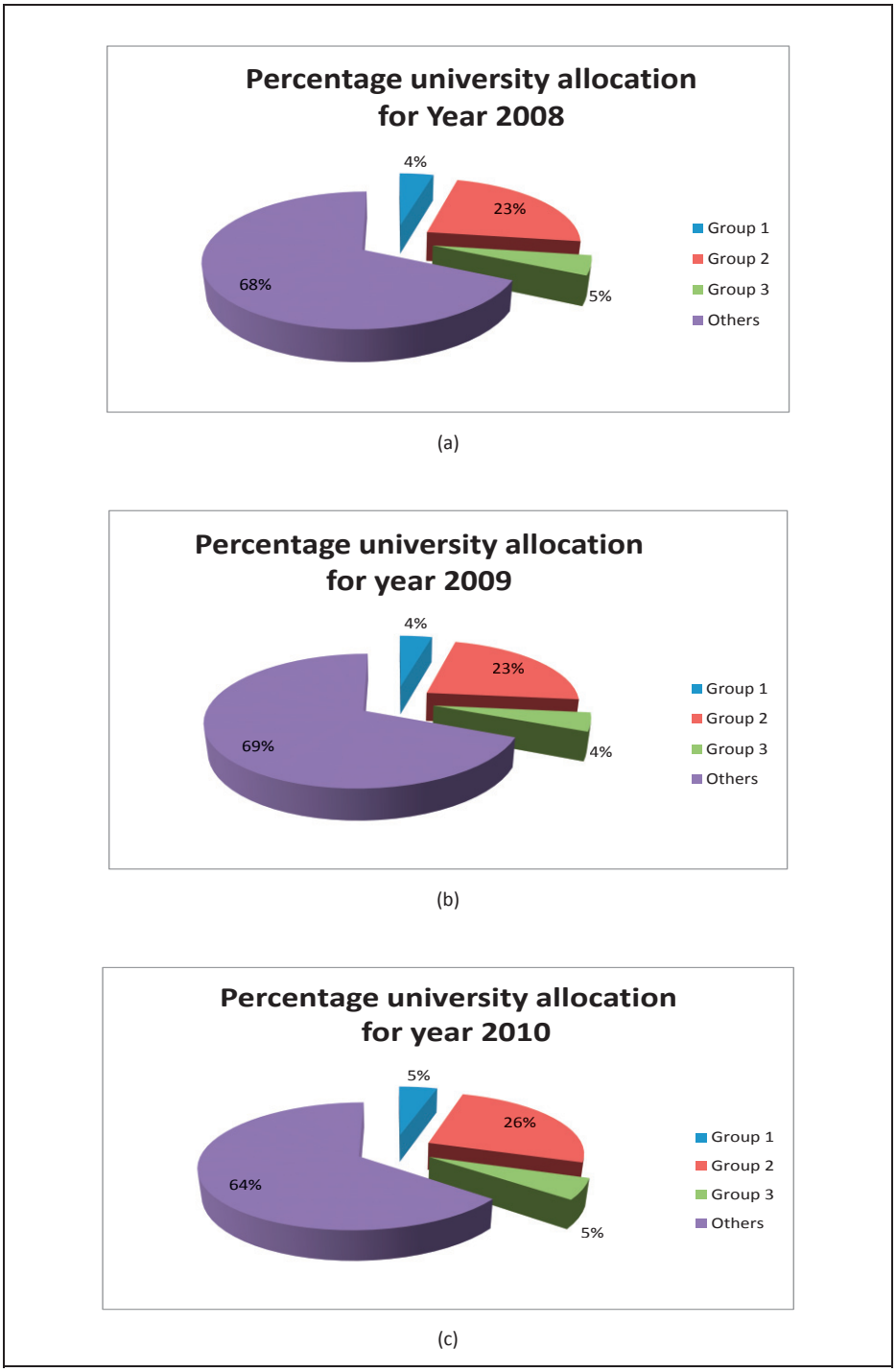

Fig.1 Proportion of University Allocation for Year 2008 to 2010

Group 1 and Group 3 can be categorized as non-science and Group 2 is science-based. About 8.6% to 10% from the university's allocation have been allocated to non-science groups since year 2008 to year 2010. The allocation for science-based group is about 22.7% to 25.5% of the total university's budget for year 2008 to year 2010. In this preliminary analysis, we found that the ratio of the operating management budget allocated for non-science groups compared to science-based group is 1:3. Figure 1 also shows that about 32% to 36% of the university's budget allocation is allocated for academics' operation management each year.

Table 1. Analysis of 2008 – 2010 Budget Allocations (in %) according to Group

	Group 1	Group 2	Group 3
Maximum allocation	4.67%	25.52%	5.43%
Minimum allocation	4.01%	22.66%	4.59%
Average allocation	4.29%	23.76%	4.91%
Standard deviation	0.31%	0.47%	0.41%

Table 1 shows descriptive analysis on university budget allocation. Maximum allocation for Group 1, Group 2 and Group 3 are 4.67%, 25.52% and 5.43%, respectively. The minimum budget allocated to Group 1, Group 2, and Group 3 is 4.01%, 22.66% and 4.59%, respectively. The average allocation of Group 1 is 4.29%, Group 2 is 23.76% and Group 3 allocation is 4.91%. The standard deviation for the three groups ranges from 0.31% to 0.47%. The results in Table 1 also show that group of science-based (Group 2) received higher allocation as compared to those of the non-Science groups (Group 1 and group 3).

3.2 Pareto Diagram

Group 1 involves n_1 faculties, Group 2 involves n_2 faculties and Group 3 involves n_3 faculties. Figure 1, Figure 2 and Figure 3 show the average budget allocation for the year 2008 to 2010 for Group 1, Group 2 and Group 3, respectively. Pareto graph is employed using a ratio of 80:20 which results in determining faculties that will be among the 20% of the total number of faculties in a group with accumulated allocated budget which is less than or equal to 80% of the total budget.

Figure 2 show that Faculty A received the highest budget while Faculty B and Faculty C received the second and third highest budget allocation among n_1 faculties of Group 1. Thus, Faculty A, Faculty B and Faculty C are considered as the vital few causes of high budget allocation. This is because Faculty A, Faculty B and Faculty C make up 20% of the total number of faculties in Group 1 that received 80% of the budget. Figure 3 shows the average budget allocation for the year 2008-2010 for Group 2. Seven faculties namely Faculty D, Faculty E, Faculty F, Faculty G, Faculty H, Faculty I and Faculty J are among the 20% of the total number of faculties in Group 2 receiving high budget allocations that account for 80% of the total budget for the group. Figure 4 shows the average budget allocation for the year 2008-2010 for Group 3. Only 4 faculties are included in the 20% of the total faculties within the group receiving high budget allocations (accumulation of 80% of the total budget for this group). These four faculties are Faculty K, Faculty L, Faculty M and Faculty N. This is due to only few faculties in this Group 3 as compared to Group 2, which has the largest number of faculties.

As a result, based on Figure 2 to Figure 4, fourteen faculties have been identified with high budget allocations which are responsible for 80% of the high budget allocation for each respective group. Thus, these faculties are noted as the dominant faculties with high budget allocations in this university. This finding can be used as one of the factors to determine the scope of our main study which concerns with the university's budget allocation.

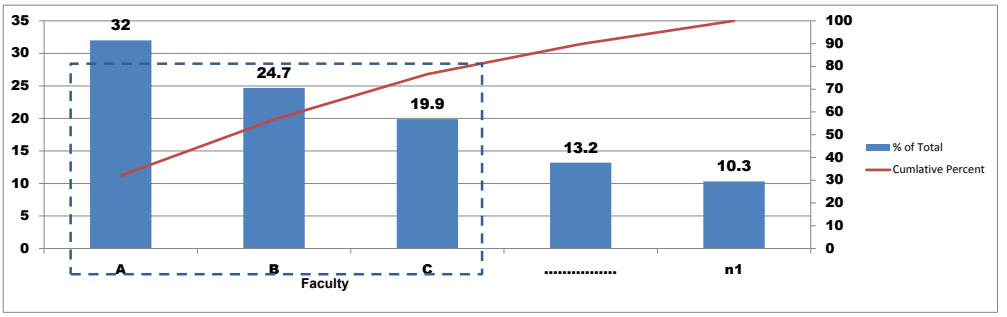

Fig. 2 Average budget allocation for year 2008 -2006 for Group 1

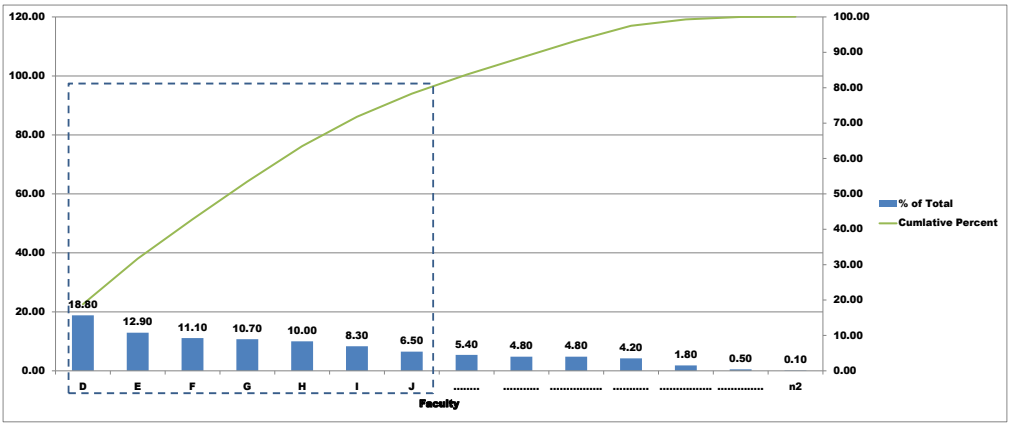

Fig. 3 Average budget allocation for year 2008 - 2010 for Group 2

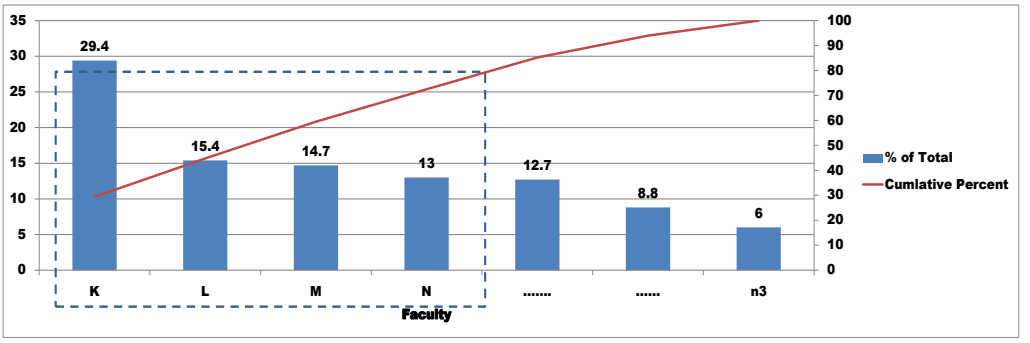

Fig. 4 Average budget allocation for year 2008-2006 for Group 3

4. Conclusion

Budget planning plays an important role in resource allocation in which it can be a tool for a structured approach for efficient utilization of resources. Budget planning assists allows decision makers to systematically

plan the budget to be allocated for the budget activities to achieve certain objective or goals desired by the each department or the organization. For a university, especially a public university, budget planning is a vital exercise which must be executed with care by analysing the past records and future strategic plans. The aim of this budget planning is not just to achieve the university's goals but, most importantly, to align with the government's vision and objectives by utilizing the limited budget allocated by the government.

This paper presented the findings of our preliminary study that describes operation management's budget allocation of one of the public universities in Malaysia. This preliminary study is a part of our main study which is concerned with the development of a mathematical model for budget allocation and control model in a budget planning of a public university. Analysis was carried out based on budget distribution data of three groups of faculties, which are grouped together according to their academic areas, at a selected university. Based on this budget data of year 2008 to 2010, the results show that 8% to 10% of the university's budget was allocated to non-science groups while 23% to 26% were allocated to the science-based group. In this preliminary analysis, we also found that the ratio of the operating management budget allocated for non-science groups as compared to the science-based group is 1: 3. Aside from that, we also found that the university's budget allocated for academic operation management was between 32% and 36% each year.

In this preliminary study, we have employed Pareto graph analysis to identify the areas in highest financial operation management allocation that have the greatest cumulative effect on the university's overall budget. As a result, ten faculties have been identified as dominant faculties since they received high budget allocations in proportion to the total university's budget. This finding of the preliminary study can be used as a basis in determining the scope of our main study that looks for a fresh approach in university's budget planning which encompasses the element of budget allocation and execution. Further exploratory data analysis is to be carried out to determine the trend in budget allocations and spending behaviour of groups of faculties and individual faculty.

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